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The digital sharing economy: A confluence of technical and social sharing

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ABSTRACT

With the diffusion of digital technologies, new forms of sharing have emerged called 'the sharing economy'. Digitalization has been the enabler for covering a broad range of sharable resources (technical aspect of sharing) and for operating beyond the limits of small groups and personal relationships (social aspect of sharing). This two-fold digital transition of sharing has enabled unprecedented efficiency in coordinating access to resources. It has created new patterns and practices of sharing in the space between traditional sharing on the one hand and the formal market economy on the other; leading to the emergence of a new class of resource allocation systems which we call 'the digital sharing economy' (DSE). We analyse the DSE as a socio-economic phenomenon without referring to normative presuppositions, such as the presence of pro-social motivations for sharing. Building on a comprehensive definition of the DSE, we propose a theoretical framework for it that embraces and structures the broad variety of sharing platforms and the practices promoted by them. By separating our analysis from normative premises about sharing, we hope to contribute to an unbiased discussion of the sharing economy phenomenon and to lay the ground for differentiated assessments which refer to explicit normative frameworks such as sustainable development.

1. Introduction

Since time immemorial, sharing has been a way of allocating resources within families and other small communities. With the global diffusion of digital information and communication technology (ICT), in particular the Internet and mobile end-user devices for accessing it, new forms of sharing have emerged. The most striking difference compared to traditional ways of sharing is that sharing practices have now escaped from the constraints of local and social proximity, since sharing is now possible among people in and across diverse and spatially distributed groups with very few constraints of time, place, and communication mode, which is made possible by digital platforms coordinating the processes.

While in the beginning, the new digital form of sharing was dominated by information as the resource being shared, it has later been extended to include other immaterial resources (such as time and skills) and even material resources (such as vehicles and tools). By incorporating the physical world, the sphere of virtual sharing has not only enhanced local sharing communities, but also made sharing feasible for widely distributed communities. Sharing even among strangers has become convenient, efficient, and effective. Today's sharing communities have scaled up, accommodating many more (potential) participants. In other words, the ongoing digital transition of society has also been a transition of sharing practices, whereby digital technologies made sharing practices, which were

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formerly restricted to "intimate social groups" (Price, 1975), scalable to large communities of users with very low entry barriers. These new qualities, together with an increasing interest in the 'shared- use' instead of the 'ownership' mode of consumption (Matzler et al., 2015), developed sharing into an extensive phenomenon currently being discussed as 'the sharing economy'.

Despite the popularity, significance, and expected growth of the sharing economy (Godelnik, 2017; Yaraghi and Ravi, 2017; Ranjbari et al., 2018), the lack of a clear theoretical establishment (Petrini et al., 2017) and of an agreed-upon definition of the term 'sharing economy' are deplored (Botsman, 2013; Koopman et al., 2015; De Rivera et al., 2017; Palgan et al., 2017; Skjelvik et al., 2017; Sanasi et al., 2020). The broad diversity of the fast-growing sharing economy and the variety of interpretations make it challenging to introduce a well-defined framework that can cover the entire phenomenon (Schor, 2014; Ranjbari et al., 2018). In particular, some of the practices and services emerging in the sharing economy have created controversies about their relationship to basic values that are traditionally associated with 'sharing'; opening the door for including normative aspects into the discourse about the sharing economy. The main aim of our approach as described in this article is to strictly separate normative from descriptive aspects, i.e. avoid mixing statements about *what should be* into statements about *what is* the case. By providing a neutral and inclusive descriptive framework, we lay the ground for discussing the normative aspects separately and with explicit reference to normative frameworks such as sustainable development, as we do in other contributions to the discourse (Pouri and Hilty, 2018a, b, 2020a, b).

Focusing on the enabling role of digitalization, we develop a (descriptive) conceptual framework for what we call the digitally enabled sharing economy or 'the digital sharing economy' (DSE) for short (Pouri and Hilty, 2018a, b). By sketching this framework, we classify the wide spectrum of sharing systems which have emerged as a by-product of the digital transition. The framework consists in three definitional dimensions: the technical dimension, the social dimension, and the coordination dimension. It is based on the idea that a key defining characteristic of the DSE is the confluence of technical and social aspects of sharing, enabled by the digital platforms implementing the coordination mechanisms needed for matching demand and supply.

The remainder of this article progresses as follows: Section 2 introduces a transition-centric approach to describe different aspects of change in sharing through the digital transition of society. In Section 3, we present a neutral and inclusive definition for the DSE concept and introduce the distinction between three fundamental aspects of sharing in the DSE: the technical, the social, and the coordination aspect. Section 4 presents a matrix that maps the technical and social aspects of sharing and conceptualizes the confluence of these two aspects by introducing typologies of sharable resources and sharing practices in the DSE. In Section 5, we defend our position to include for-profit and commercial sharing schemes in the definitional and theoretical scope of the DSE. In the final section, we draw some conclusions about the nature of the DSE phenomenon, which fills the space between the pre-existing extremes of traditional sharing and the formal market economy.

2. The digital transition of sharing

To characterize sharing in the digital form, we adopt a transition-centric approach to analyse how sharing has adapted to and developed along with the opportunities provided by the diffusion of digital ICT. These opportunities mainly consist in new ways of coordinating sharing practices via online digital platforms. The increasing technology-based power of coordination makes it possible to involve more participants, create larger pools of sharable resources, and include resources of increasing variety.

The transition-centric approach helps to clarify what aspects of basic, traditional sharing still continue to exist in digitally enabled sharing and what has changed. Primarily, we draw on an overview of definitions of 'sharing' (Table 1). Based on these definitions, we then describe changes through what we call 'the digital transition of sharing'.

In its traditional form, according to Price (1975), sharing holds high levels of (mutual but unequal) responsiveness to the needs and inequities within a community. This quality can be basically realized in small communities (Price, 1975) and among close kin, friends, family, and "pseudo-family" (Belk, 2014b), or more generally among people who know each other well enough to share things. Therefore, sharing originally could only be practiced in communities which are "small in scale and personal in quality" (Price, 1975, p.4).

Such argument, however, renders the possibility of sharing debatable for large groups (Price, 1975). Large groups, in this context, are groups that surpass local communities in size, diversity of needs, and therefore complexity of required coordination. In sufficiently large communities, people normally do not cultivate relationships prior to engaging in sharing activities. This shows that sharing practices are in transition. Up to which point they should still be called 'sharing' is a matter of definition. We advocate for a broad, inclusive definition (details in Section 3) for these reasons: First, a resource that can be (and is) accessed by several users is "shared" in the purely technical sense. However, it would be too shallow a perspective to just define that any shared resource use demonstrates sharing, since the concept of sharing essentially includes the aspect of social practice too. Instead, we view sharing as a combination of both technical and social aspects but avoid being too restrictive on the social side because otherwise, the most interesting emerging forms of sharing in the DSE could be excluded *a priori* from the analysis. In other words, sharing always needs both a technical action (providing access to a resource) and a social practice which is connected to this action. The social practice has, among others, the functions of agreeing about both performing this action and the legitimate expectations it implies. As these social practices are in transition – mainly due to the new possibilities provided by online platforms – no part of the emerging patterns should be excluded *a priori* from the concept of sharing in order to avoid a normative bias in the analysis.

The DSE is based on platforms that endorse sharing practices with digital technologies, a fact that makes it an example of the digital transition of society. The growth and popularity of the DSE is largely due to the fact that it enables individuals to connect and develop peer networks ('peer' in the sense of an individual with similar needs and powers) for engaging in sharing regardless of time, place, communication, and coordination limits, as it holds true for many activities in the digital age. This dynamic and collaborative participation ('dynamic' in the sense of active involvement and 'collaborative' in the sense of mutual actions of the participants) allows

Table 1
Definitions of 'sharing'.

Source	Definition	Additional characterization
Price (1975)	"It [sharing] is the allocation of economic goods and services without calculating returns, within an intimate social group, and patterned by the general role structure of that group. It is an economic behavior with a heavily weighted social dimension." (p. 4)	- Sharing is an economic behavior. - Sharing is rooted in social groups. - Sharing is based on intimate – i.e., "small in scale and personal in quality" (p. 4) – social groups. - Sharing does not scale well to large communities. - For sharing to be viable, a community "must be small enough to be sensitive to individual differences and to develop personal ties that override inequities." (p. 7)
Benkler (2004)	"… social sharing and exchange is an underappreciated modality of economic production, alongside price-based and firm-based market production and state-based production, whose salience in the economy is sensitive to technological condition." (p. 276)	- "Technology does not determine the level of sharing. But it does set threshold constraints on the effective domain of sharing." (p. 278) - "Efficacy of individual action depends on the physical-capital requirements for action to become materially effective, which in turn depend on technology." (p. 339).
Belk (2007, 2010, 2014a)	- "[Sharing is] the act and process of distributing what is ours to others for their use as well as the act and process of receiving something from others for our use." (Belk, 2007, p. 127; Belk, 2014a, p. 10) - "Sharing is an alternative to the private ownership that is emphasized in both marketplace exchange and gift giving. In sharing, two or more people may enjoy the benefits (or costs) that flow from possessing a thing." (Belk, 2007, p. 127; Belk, 2014a, p. 10)	- Sharing is a third form of distribution besides marketplace exchange and gift giving. - Sharing is characterized by creating social links with others. - Sharing includes voluntary lending and allocating resources. - Sharing does not include contractual renting and leasing. - Sharing is a non-reciprocal practice which does not imply reciprocal expectations. - Sharing does not involve transfer of ownership; it is based on joint ownership. - "… sharing can foster community, save resources, and create certain synergies." (Belk, 2007, p. 126)
John (2017)	- "... sharing … referred – and still does refer – to the division, or distribution, of resources." (p.9) - "Another meaning of sharing is to have something in common with someone" (p.9)	- Social relations are fundamental to sharing. - "… when a practice is called 'sharing' a certain stance between the participants in that practice is posited; this stance might involve values such as openness, trust and may be a sense of commonality." (p. 7) - "In addition to being an act of distribution, sharing can also be an act of communication." (p.10)

a large number of peers to gain a share of what others already have to offer, and to enjoy the economic and social benefits of sharing.

Even before personal computers and the Internet existed, Price (1975) envisioned the potential of computer networks to make sharing systems scalable: "It can be argued that large scale yet still 'personalized' sharing systems are being operated with the aid of computers, but these are new and relatively unstudied systems, mostly of universities, commercial cooperatives, and similar organizations." (p. 7). The global Internet, however, grew out of these first computer networks and people are now able to access it with mobile end-user devices anywhere, anytime. The development of the Internet and particularly social media technology has contributed to new ways of sharing (Belk, 2014a, [Belk, 2014b] b). More specifically, ICT-enabled platforms facilitate the social dynamics that are required for 'actual' sharing (Hamari et al., 2016) and support online interaction and assistance with the provision and acquisition of services (Liang and Turban, 2011).

Participants in digital sharing opt in at need and benefit from unprecedented flexibility in terms of freely deciding which task to do, when, and for how long (Ke, 2017). This flexibility – which is a key affordance of the DSE (Sutherland and Jarrahi, 2018) – corresponds to the voluntary nature of sharing practices in its traditional context (Belk, 2007). In other words, sharing is voluntary and participating in digital sharing, compared to the traditional form, even makes substantially more voluntary activities possible (both per se and as a result of the network effect) and thus enhances the efficacy of sharing by increasing the number of possible 'matches' (Sutherland and Jarrahi, 2018) and performed services within a network.

"A change in technology… that increases the supply of opportunities for sharing should … increase the prevalence of sharing practices" (Benkler, 2004, p. 340). This argument proves particularly relevant for the change in technology that today is referred to as the 'digital transition'. Obviously, traditional sharing is confined to a limited amount of sharable resources (fewer participants and thus a smaller potential to increase supply). In digital sharing, communities (i.e., networks of participants) are remarkably larger with a correspondingly larger amount and greater diversity of resources that can be shared. Participants can enjoy higher predictability to receive what they want in a large network of sharing and, therefore, the effectiveness of sharing actions increases within the network. This way, digital platforms fulfill the technology-reliant efficacy of sharing actions, as addressed by Benkler (2004).

3. Defining the digital sharing economy (DSE)

While sharing practices and allocation systems for economic goods based on them are not new and may have existed since the times

of early human societies, the term 'sharing economy' emerged within the past decades. The new characteristic of this phenomenon is that sharing takes place in the context of digitalization: utilizing ICT devices and infrastructure in general – and online platforms in particular – as the facilitators of sharing activities.

Since the mention of the term 'sharing economy' in the work of Lessig (2008), there has been a proliferation of literature proposing definitions for it or introducing perspectives on it (e.g., Botsman, 2013; Koopman et al., 2015; Puschmann and Alt, 2016; Frenken and Schor, 2017). Some studies have provided reviews of these definitions and/or perspectives (e.g., Breidbach and Brodie, 2017; Görög, 2018; Ranjbari et al., 2018; Sutherland and Jarrahi, 2018; Curtis and Lehner, 2019).

Lessig (2008) described the sharing economy as being regulated by a set of social relations as opposed to the commercial economy where access is based only on the metric of price. In the same vein, John (2012) posits that the sharing economy is an economy "that operate[s] without money changing hands and whose goal, by and large, is not to make its participants richer." (p. 179). Botsman and Rogers (2010) relate the sharing economy with "collaborative consumption"[1] – a term that has been often used interchangeably with "sharing economy" (Gruszka, 2017) – and describe collaborative consumption as an economic model based on "traditional sharing, bartering, lending, trading, renting, gifting and swapping, redefined through technology and peer communities." (p. xv). Botsman (2013) defines the sharing economy as "an economic model based on sharing underutilized assets from spaces to skills to stuff for monetary or non-monetary benefits" with the possibility of embracing both consumer-to-consumer and business-to-consumer models. Böcker and Meelen (2017), however, exclude business-to-consumer services from the sharing economy. In a similar conceptualization, Frenken et al. (2015) include only consumer-to-consumer models in the sharing economy and exclude the case that consumers rent a good from a business. They characterize the sharing economy as "consumers granting each other temporary access to under-utilised physical assets ('idle capacity'), possibly for money." (Frenken et al., 2015). 'Access-based consumption' and 'collaborative consumption' are related terms frequently used in this context. Huber (2017) suggests subsuming them under the wider concept of sharing economy.

In a critical interpretation, Belk (2014b) dissociates many practices in the sharing economy from what is "genuine sharing" in his view. He juxtaposes genuine sharing with marketplace exchange and defines it as "the act and process of distributing what is ours to others for their use and/or the act and process of receiving or taking something from others for our use" (Belk, 2014b, p. 1596; see also Table 1), whereas collaborative consumption is characterized by "the acquisition and distribution of a resource for a fee or other compensation" (Belk, 2014b, p. 1597). In his view, many popular practices that are bestowed the label of 'sharing' in the sharing economy should instead be assigned to the disjoint concept of collaborative consumption.

In our viewpoint, however, the concept of collaborative consumption is both too narrow and too broad to precisely describe the spectrum of sharing practices that take place in the realm of what should be covered by a fruitful definition of the term 'sharing economy'. It is too narrow because there are sharing practices in which only one side of the collaborating participants consumes. For example, in the case of Uber, the drivers are rather producers (of a service) than consumers, even though they are sharing their cars with passengers. This is different from the case of ride sharing platforms such as BlaBlaCar, where the driver would already drive a route anyway (regardless of whether more people are travelling with him/her), thus producing and consuming the journey at the same time while sharing it with others.

On the other side, the concept of collaborative consumption is too broad because there are forms of collaborative consumption – namely gifting (Botsman and Rogers, 2010) and bartering (Belk, 2014b) – that could be excluded from the sharing economy for good reasons. The gift economy, which has been studied in the contexts of moral economy and political economy (e.g. in Cheal, 2015), is generally distinguished from other economic systems. From the perspective of sharing, once a good is donated or exchanged, it is withdrawn from the scope of sharing. With the change of ownership, a good may enter a redistribution or reuse cycle. While in some studies recirculation of goods is included in the category of sharing practices (e.g. in Schor, 2014), we favour a view of sharing that strictly excludes practices involving transfer of ownership. The essence of sharing, in our view, is that a resource owned by an individual or a community can be accessed by many users while the ownership remains the same. In other words, in a sharing system, the utilization of a resource is increased only by intensified access to it and not through multiple ownerships over its service-life.

Based on the above considerations and arguments, we define the digital sharing economy (DSE) as follows:

> *The digital sharing economy is a class of resource allocation systems based on sharing practices which are coordinated by digital online platforms and performed by individuals and possibly (non-) commercial organizations with the aim to provide access to material or immaterial resources. Digital sharing systems operate in the space between traditional sharing and the formal market economy.*

This definition addresses three fundamental aspects of sharing in the DSE, which we call the 'technical', the 'social', and the 'coordination' aspect:

- The technical aspect of sharing refers to the characteristic of a resource that it can be used to serve multiple demands regardless of the mechanism that allows for this common use to actually happen. This aspect addresses the *shareability of resources*.

[1] The notion was originally coined by Felson and Spaeth in 1978 in the sense of *sharing the act of consumption*. Collaborative consumption occurs in a situation "…in which one or more persons consume economic goods or services in the process of engaging in joint activities with one or more others." (Felson and Spaeth, 1978, p.614). Early mentions of the term in the context of online Internet websites can be traced back to Algar's report in 2007 where he presents the core message of collaborative consumption as "Collaborating to leverage discounts and incentives is an inevitable reality of 'connected living'." (Algar, 2007, p. 16). The term gained further popularity through Botsman and Roger's 2010 book "What's Mine Is Yours: The Rise of Collaborative Consumption".

- The social aspect of sharing is about the patterns of interaction – including economic transactions –between people that make the act of sharing possible. This aspect addresses *sharing practices*.
- The coordination aspect refers to the intermediation needed for sharing. Through digital platforms, coordination mechanisms can be implemented that organize the social and technical aspects of sharing with unprecedented efficiency. This aspect addresses the *organization and scalability of sharing*.

In the remainder, we will elaborate on these aspects.

3.1. Technical aspect of sharing (sharable resources)

The digital transition of sharing has changed the ways of providing and receiving access to a variety of resources, both material and immaterial ones. The only constraint that applies is that the resource has to be sharable in the technical sense. We classify sharable resources in the following categories because they are essential to understand the process needed to implement the act of sharing:

- **Durable material goods:** The act of sharing puts the unused capacity of a durable material good into productive use. Every time a durable material good is shared, its unused capacity comes into utilization, either to serve more demand in parallel (using *free* capacity, e.g. occupying free seats of a car via ride-sharing) or to serve more demand in sequence (using *idle* capacity, e.g. when sharing a household tool in the neighbourhood reduces the idle time of that tool). Carpooling platforms (e.g., BlaBlaCar) are familiar examples that feature using free capacity. Examples of platforms that promote the use of idle capacity are tool-sharing platforms such as Peerby, Uber's typical services which make use of the idle capacity of cars, and Airbnb which enhances the utilization of accommodations. The essential difference between *free* and *idle* capacity is that in the former case, the resource is already being used but its utilization factor can be increased by sharing.
- **Consumable material goods:** Although consumable material goods (such as food) are exhausted when consumed, they can be divided while being consumed in a group. Consumable goods are shared for two possible reasons: They are intended to be sufficient for all or there is an abundant availability of them. This abundance is shared, for example, to avoid waste. While being meaningful, the distinction between these two cases may be blurred and may also depend on the intention of the provider of the shared goods.
- **Durable immaterial goods:** This subsumes competence and durable information goods. Competence encompasses "the knowledge, skills, abilities, traits and behaviors that allow an individual to perform a task within a specific function or job" (Boyatzis, 1982 in Vathanophas, 2007;). For example, skills like teaching a language or repairing a tool are competences one could share with others. TaskRabbit is a familiar example of platforms of this type. 'Durable information goods' refer to information products with timeless content such as software products (Linde, 2008), music, educational content, etc.
- **Consumable immaterial goods:** Consumable immaterial goods either cannot be stored (such as the time someone spends walking a neighbour's dog) or they lose their value fast over time. The latter is true for 'consumable information goods' (such as breaking news) which can be distinguished – albeit not sharply – from 'durable information goods' like software or timeless content which allow for repeated use without fast degradation of value. Examples of sharing consumable information goods are participatory sensing environments in which volatile information – e.g., about the traffic situation – is shared through community-based participation (Whitney and Lipford, 2011).

By introducing these categories of sharable resources, we conceptualize the *what* (the object) of sharing.

3.2. Social aspect of sharing (sharing practices)

Although (traditional) sharing has been characterized as a non-reciprocal behaviour that does not involve equal exchange or an expectation of equivalent returns by some authors (e.g., Benkler, 2004; Price, 1975), the broader concept of sharing that we are using to capture the essence of the DSE foresees several possible levels of expectation in return for the access provided. In the following, we will refer to the access provided to a resource as 'the service', to the person who provides the service as 'the provider', and to the person who receives the service (i.e., who utilizes the resource) as 'the receiver'.

When the expectation to receive something in return for the service is legitimated by the platform as a rule for participation, either *reciprocity* or *compensation* is applied. Reciprocity fits well to economic allocation (Price, 1975). It is a salient feature of interaction in the sharing economy (Starr et al., 2020) that contributes to regulating platform participation and, as a social norm, requires people to "respond to others' actions with an equivalent action" (Proserpio et al., 2018; p. 372). Where an equivalent service is not possible or not expected, a rule for compensation may be involved. Compensation with money or other things of economic value is then expected in return for the service received. In other words, reciprocity "is exchange based on equal return or counteraction by each of two sides" (Price, 1975;) and indicates *similarity* of actions or behaviors, whereas compensation emphasizes *difference* in the behavior or actions of the two sides of interaction (White, 2015).

Palgan et al. (2017) have developed a taxonomy of sharing systems based on peer interactions that recognizes free, reciprocal, and rental models in the domain of accommodation sharing. By refining such classifications and generalizing them to all platforms (more

precisely, to all types of *sharing business models* (Pouri and Hilty, 2020c)) – regardless of the domain in which they operate – we further develop the existing classifications. In particular, we differentiate between the following levels of legitimate expectation in sharing, which in fact constitute the *how* (the modality) of sharing:

1 Without reciprocity or compensation.
2 With informal reciprocity or compensation: The receiver of a service is recommended (not enforced) to offer an equivalent service or compensation to the provider or to the community at some point.
3 With formal reciprocity or compensation: The receiver of a service is enforced to offer an equivalent service or compensation to the provider or to the community at some point.
4 With formal monetary compensation to the provider *per unit of service received*.

In Section 4, we will conceptualize these sharing practices of the DSE based on what resources are shared and how sharing is practiced. Before doing so, we have to introduce the third core aspect of the DSE, which is coordination.

3.3. Coordination aspect of sharing (digital platforms)

The digital transition is driven by the fact that historical technologies for receiving, processing, storing, and transmitting information all became electronic and digital, which let them converge into one technology today called 'digital ICT'. Online platforms are a prime example of the enabling effect of digital ICT. In the DSE, online platforms mediate sharing on the Internet and are accessible via smartphones and other end-user devices. We may also refer to them more specifically as 'coordination platforms' or 'digital sharing platforms' as the main mode of operations that has enabled new forms and practices of sharing.

A digital sharing platform is the ICT-based operational representation of a specific instance of the sharing economy, for which we also use the term 'sharing system'. The function of platforms is to implement coordination mechanisms that systematically match supply and demand by providing a "search and matching environment" (Newlands et al., 2018) and to coordinate all other activities involved in sharing, including transactions and post-sharing activities such as reviews.

Digital sharing platforms facilitate capitalizing on underutilized assets (Ganapati and Reddick, 2018) by making it possible for individuals to have (semi-)direct transactions in their peer networks at very low search and transaction costs (Henten and Windekilde, 2016; Puschmann and Alt, 2016). Transaction costs are "all the costs and trouble incurred in making an economic transaction" (Williamson, 1981 cited in Frenken and Schor, 2017, p. 6). They are "inherent in finding trading partners, coming to terms, executing payments, handing off the good" (Horton and Zeckhauser, 2016, p. 14) and crucial in processing information about supply, reliability and contract forms (Frenken and Schor, 2017). In large-scale networks, the transaction costs would become huge if the same processes as in traditional sharing were to be performed. Reducing transaction costs can be a result of, for example, minimizing the amount of information that needs to be exchanged in order for a match to be found and agreed upon (Horton and Zeckhauser, 2016); this is exactly where digital platforms can play out their strengths. This way, the economic benefit of platform-enabled sharing with near-zero transaction costs results in a very low marginal cost for providing a service (Rifkin, 2014). This eminent feature may have fuelled the trend of transforming consumption from an ownership mode to a shared mode (Belk, 2014b; Barbu et al., 2018; Cherry and Pidgeon, 2018). These advantages of digital platforms have also improved the efficiency of the traditional renting mode (e.g., in the case of car rentals or apartment bookings), but we still see a difference between "digitalized" traditional renting on the one hand and the new business models emerging in the DSE on the other (see Sections 4, 5, and Pouri and Hilty (2020c)).

Digital sharing platforms provide the functional mechanisms required for generating trust in large-scale networks. Successful transactions in sharing systems are highly contingent on the presence of trust (Möhlmann and Geissinger, 2018), especially in contexts where strangers interact with each other and perform transactions beyond their relationship with their family, friends, or other small-scale social groups. In its traditional practices, sharing was confined to known, trusted individuals and social contacts (Frenken and Schor, 2017). In digitally enabled sharing, however, platforms are rather required to promote mechanisms that replace such familiarity. Platforms are expected to establish patterns and mechanisms to initiate and maintain trust among peers and in the platform operators themselves (Hawlitschek et al., 2016). Such patterns and mechanisms may include users' profiles and images, identity verification, records of past behaviour, mutual review and rating, and online communication (Hawlitschek et al., 2016; Frenken and Schor, 2017; Teubner and Dann, 2018; Li and Wang, 2020).

4. Conceptualizing resource sharing in the DSE

Relating to the aspects of sharing, as explained in Section 3, the technical and the social ('what' and 'how', respectively) aspects of sharing are transformed and made scalable by digitally enabled coordination mechanisms. Fig. 1 shows a matrix to classify the spectrum of sharing systems based on the *what* and *how* of sharing. The essence of this matrix is that the DSE has started to fill the space left open between traditional sharing and the formal market economy. The DSE does so by creating several new sharing systems that belong to neither of these extremes.

The vertical dimension represents the technical aspect, i.e. the types of sharable resources. For completeness and comparison of views, we include practices that involve the transfer of ownership and are therefore by our definition excluded from the DSE (top three rows of Fig. 1). The horizontal dimension represents levels of increasing formality of sharing between the following two extreme cases: the traditional concept of sharing which is practiced in small, intimate groups (complete informality), and the formal market economy which has fully regulated mechanisms for enforced monetary compensation (complete formality). The four columns in between

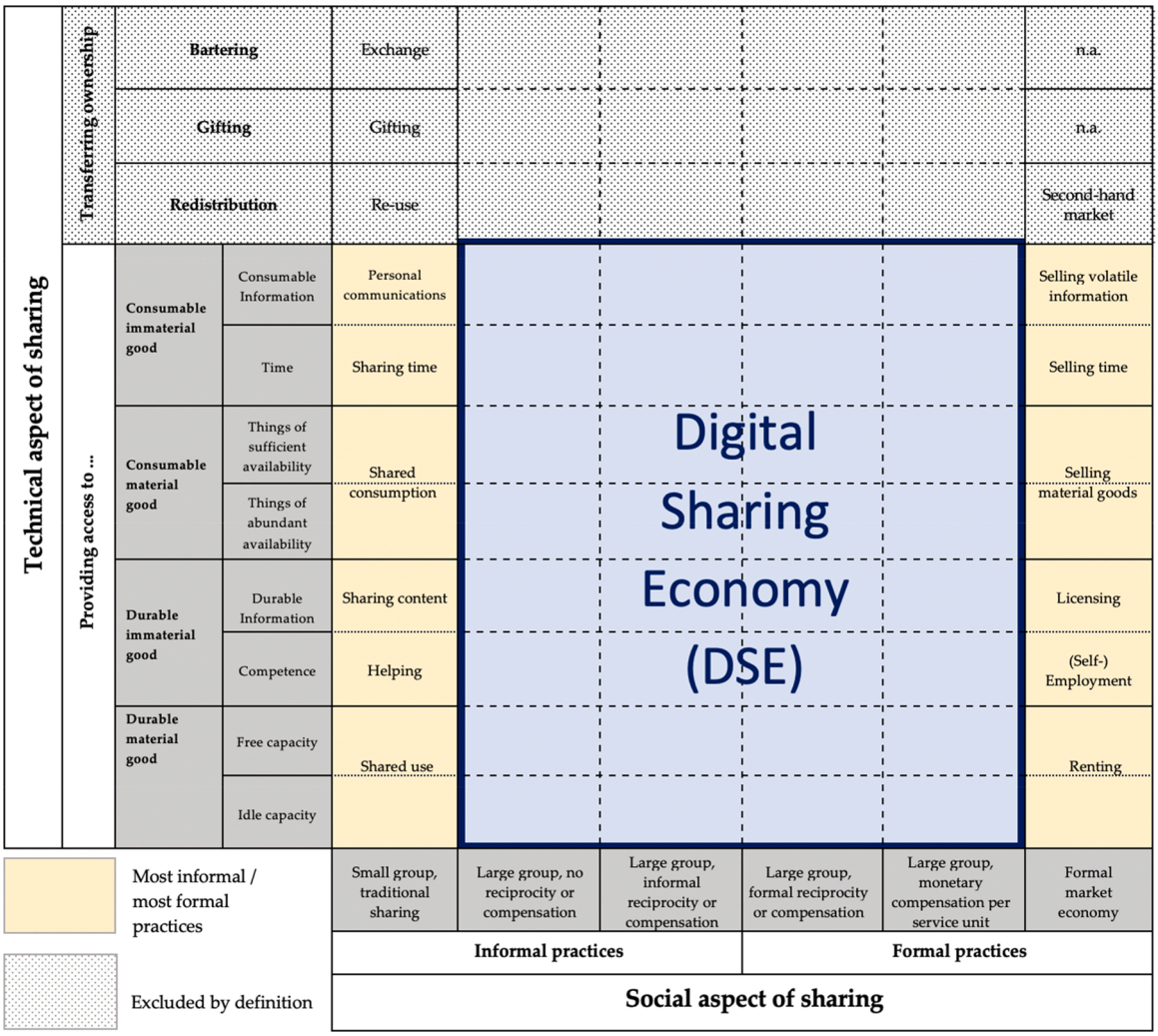

Fig. 1. Matrix to classify technical and social aspects of sharing practices. The DSE (blue box) covers the broad spectrum between the extreme cases of traditional sharing in small groups and the formal market economy (on the horizontal axis) and excludes practices of transferring ownership. See the Appendix for examples of the sharing systems mapped to this matrix.

correspond to the four levels we introduced in Sub-section 3.2.

Since formality is of central importance in our conceptual framework, we briefly clarify how we are using the term. In the context of the DSE, the term 'formality' is used in two related meanings. First, the basic idea connects to Price (1975) who states: "In sharing there is a low level of formality or protocol and little need to acknowledge what is being contributed or taken." (p. 23) By extending this idea, we created our "levels of formality" in sharing shown on the horizontal axis of the matrix. This concept of formality essentially addresses to what extent a platform enforces reciprocal actions (or compensations) in return for the provided services.

The second meaning of 'formality' is about the regulation of markets. In this context, the "informality" of the markets created by the DSE (Williams and Horodnic, 2017) opposes formal markets and their regulations. This happens as platforms can circumvent formal regulatory frameworks by developing unregulated digital marketplaces especially with respect to human labor (Farronato and Levin, 2015; Martin, 2016; Acquier et al., 2019).

We see these two concepts of formality coupled in the DSE: The more internal formality a platform applies, the more it will drift towards a business in the formal market as it faces the issue of compliance with the existing external regulatory frameworks including, for example, tax and insurance issues. To put it simply, internal formality creates the need for external formality. We think, however, that all sharing platforms implicitly refer to the external regulatory frameworks and the formal markets as a *normality from which they*

stand out, and that keeping up this difference – in one way or another – is their nature and usually the core of their success.

Digitalization has enabled the evolutionary expansion of sharing as a class of resource allocation systems into the blank space between traditional sharing in small intimate groups and the formal market economy. This space, as shown in the matrix, can be subdivided in a number of niches depending on the type of the resources being shared and the practices that implement the social norms promoted and the economic transactions enabled by a particular platform.

There are 'free' sharing schemes that feature services without any reciprocity or compensation. Some schemes are based on norms that are not enforced but encouraged by the platform, creating legitimate expectations among the participants. On the other hand, formal reciprocity is found, for example, in the time- bank scheme where units of time act as currency, or in platforms where the same service is expected in return, such as home-swap for temporary holiday stays. Formal compensation is applied by platforms where a fee is charged for providing a service. Formal compensation may also have the form of a subscription fee. In cases where compensations are not strictly implemented or are only recommended (informal compensation), the contribution takes the form of informal payments, tips, gifts, or donations. For example, Couchsurfing encourages its surfers to express their gratitude to the host in some ways, such as offering a gift. Requiring monetary compensation per service unit provided represents utmost formality of the sharing practice (enforced monetary compensation). When formal monetary compensation is involved, the DSE can create an informal labour market for temporary workers that is often referred to as the 'gig economy' (De Stefano, 2015). Uber is a familiar example of this type.

To elaborate on the most formal type of sharing in the DSE (the rightmost column of the DSE box in Fig. 1, adjacent to the column representing the formal market economy), the labor market that the DSE creates – most importantly in its peer-to-peer models – still remains part of the informal sector. From a labor-market perspective, the digital sharing economy is not part of the formal economy, which is characterized by being "based on the employment of waged labor within a framework of rules and regulations, usually devised and implemented by the state, on working hours, minimum wages, health and safety at work, or the social security obligations of employers and employees" (Daniels, 2004, p. 502). Jobs in the formal economy, as opposed to jobs in the sharing economy, are protected to some extent, with regular wages or salaries, and with workers' (formal) contribution to public services through paying taxes on their income (Daniels, 2004).

By contrast, the informal economy is defined to be "comprised of all forms of 'informal employment'—that is, employment without formal contracts (i.e., covered by labour legislation), worker benefits or social protection— … including ... Self-employment … [and] Wage employment in informal jobs" (Chen, 2005, p.2). With regard to taxation in the sharing economy, platform-based markets, such as Uber, and even capital- based platforms, such as Airbnb, are claimed to have allowed for and promoted tax avoidance/evasion (Martin, 2016; Baker, 2014). While raising issues about labor conditions (Schor and Attwood-Charles, 2017; Van Doorn, 2017), the informality of the labor market created by the DSE has made it extremely easy to participate with very low entry barriers, including unskilled workers. This feature is normally not assumable with the formal sector.

The borderline between sharing systems and formal businesses is drawn by the fact that the former, even in the for-profit case, still keep elements of informality of the market and participation is entirely voluntary. The consequence of this is that not every case of the DSE may still resemble what we usually associate with 'sharing' in its traditional meaning – which holds positive moral and prosocial connotations – because values other than the common good can motivate participation and engagement in digital sharing communities.

5. Discussion: for-profit and commercial sharing

The common observation that practices in digital sharing systems may involve reciprocity or compensation, particularly monetary compensation, has raised controversies. Belk (2014a) differentiates between "true sharing" and "pseudo-sharing". He postulates that many of the for-profit sharing models that are known to offer sharing services literally involve rentals and this excludes them from the realm of "true sharing"; instead, they would promote pseudo-sharing that "masquerades as sharing" (Belk, 2014a). In his view, any form of rental (be it for short- or long-term), fails to be an instance of sharing because renting does not create a feeling of "shared ownership" with the renter/lessee or a general "feeling of community".

Our position on this and similar arguments is that incorporating services with reciprocity, with monetary transactions, or with other forms of compensation into sharing practices does *not* as such impair the concept of 'sharing': There is always the technical aspect of sharing, which is based on the objective fact that the capacity utilization of a resource is increased by shared use in the technical sense. This – to briefly point to a normative side aspect – has the potential to contribute to the sustainable use of resources, at least as long as rebound effects remain low enough (Pouri and Hilty, 2018a,b). Nevertheless, by stating that the shared use of resources is a necessary aspect of sharing, we do not consider this technical aspect a *sufficient* condition for sharing. Rather, we seek to understand the technical and social aspects of sharing in their complex interaction and co-existence. We aim to keep this analysis free of normative presuppositions, as opposed to mixing descriptions with implicit normative judgments. The latter is tempting for the social aspect because normativity lies in the nature of social norms and practices. In particular, we see no advantage in overlaying the analysis with moral and pro-social connotations of the term 'sharing' such as "sharing as caring" (John, 2017, p.2), which suggests that an altruistic motivation should be in place.

Our plea to separate descriptive from normative issues does not of course exclude the possibility to take a critical normative stance

towards different instances of the DSE. We even hope that our analysis paves the ground for a systematic critical assessment of digital sharing systems, which then can take place with reference to explicit normative requirements (as opposed to implicit normative assumptions or even bias). Such requirements could be derived from frameworks such as the existing legal frameworks and the typical legal issues of sharing platforms (McKee, 2017), or from policy frameworks such as the UN Sustainable Development Goals (United Nations, 2015).

Noticing the fact that instances of the DSE may not fully accord with the traditional, intuitive notion of sharing – which has moral connotations – is not a substitute for a systematic assessment based on explicit normative premises. The core of the DSE is that it offers the provision of resources for shared use by means of social collaboration and economic activities with low coordination/ transaction costs (Fraiberger and Sundararajan, 2015; Henten and Windekilde, 2016). Sharing in this sense may or may not go along with the mere intention of benefiting others, the community, or society at large. It may rather come with a varying and opaque mixture of motivations. The interesting question that arises here is then: What finally separates service provision in the formal market from the DSE? That is, what defines the borderline between the two rightmost columns of the matrix shown in Fig. 1? For example, what exactly marks the difference between 'sharing' and 'renting'?

As defined in Section 3, we characterize digital sharing systems as resource allocation systems (in the economic sense of the term) that operate in the space between traditional sharing and the formal market economy, which from this perspective appear as the two extremes of a broad spectrum. This has the consequence that pricing mechanisms in the DSE allow for a range from free services (a characteristic taken from traditional sharing – the lower extreme) to services that enforce a certain type of compensation, including fee-based services (an element taken from the formal market). There are reasons why even the most formalized sharing systems in the DSE can offer services at a price still lower than their equivalents provided by businesses operating in the formal market[2] .

From a market economics perspective, platforms enjoy significantly lower fixed costs (mainly costs related to platform maintenance) and lower marginal costs (near-zero cost for serving one additional customer) (Wirtz et al., 2019). In particular for consumer-to-consumer platforms, the overhead costs are considerably low compared to conventional businesses. They are almost limited to the costs of setting up and maintaining the web site or application (Zervas et al., 2017). Moreover, network effects (most relevantly, indirect network effects) within sharing systems allow for higher liquidity on the side of the platform, allowing for better data analytics, which can translate to further reduced search costs for the participants (Wirtz et al., 2019). Indirect network effects are cross-side effects that occur between the suppliers of the shared resource and the receivers of the service (which consists in accessing the resource), whereby the value of the service increases for participants on one side of the market (suppliers) when new participants of the other side (receivers) join the network, and vice versa. In fact, it is the indirect rather than direct network effect that acts as a driver to scale the business (Wirtz et al., 2019). The effectiveness of indirect effects is amplified by digital platforms (Tucker, 2018) which make it easy for users to join the community and participate in sharing. In contrast, "pipeline businesses", i.e. established businesses in traditional industries, expand their market position by maintaining control over scarce resources which provide supply-side economies of scale (Van Alstyne et al., 2016; Wirtz et al., 2019).

Further arguments for lower prices in sharing systems have to be differentiated with regard to consumer-to-consumer (C2C) and business-to-consumer (B2C) sharing models.

For C2C sharing models, reduced costs are mainly the result of pricing mechanisms in the DSE that follow a "discount-to-commercial method, where sharers offer a lower price to compensate for the 'risks' involved in a P2P transaction" (Olson and Kemp, 2015;). Moreover, services can be offered by unskilled, unlicensed people from the community (Schmid-Drüner, 2016). This means that there is no guarantee that, for example, a host on Airbnb will offer an expected standard hospitality service including security and safety standards, whereas this is binding for hotels according to some assured standards. What replaces compliance with formal standards in sharing systems is aggregated reviews and rates (Zervas et al., 2015; Pettersen, 2017), other mechanisms for generating trust and reputation (Kim et al., 2015; Ert et al., 2016), and required self-moderation[3] (e.g., Couchsurfing, 2018).

For B2C sharing models, the reduced price can result from requiring considerably fewer, in cases close-to-zero, human resources for performing parts of the business. This leads to a reduction (or even elimination) of the expenses associated with the formal employment of staff (expenses for insurance, job security and protection, etc.), and passing on those tasks and responsibilities to the individual responsibility and social collaboration of consumers taking part in the sharing system. In other words, the business models of commercial sharing platforms are based on customers' engagement in the process of service provision (Pouri and Hilty, 2020b). This results in externalizing some costs by burdening the community with tasks that normally would generate expenses for the provider in a formal setting. For example, Zipcar requires its users to return the cars clean and not to leave them with low fuel so that every car is

[2] Exceptions can be observed when dynamic pricing models become effective, especially in peer-to-peer services. Dynamic pricing is already practiced in Uber's "Surge pricing" or in Lyft's "Prime Time", where a consumer faces prices ranging from a base price to multiples of that price (Newlands et al., 2018). The reason is to allow for improved matching through allocating available capacity based on marginal utility (Wirtz et al., 2019). For example, surge pricing with Uber riding service is applied when an unusually large number of people call for an Uber trip at the same time and there are not enough drivers on the road to serve the uptick in ride requests. Although Uber and similar platforms usually offer cheaper riding services compared to conventional taxicab companies, this may not be always guaranteed with dynamic pricing – i.e., when the ideal of efficient allocation is striven for even more consistently than in the formal market economy and prices can adapt to the market situation from one minute to the other.

[3] For example, Couchsurfing introduces itself as a "self-moderating community" in which members are responsible for their choices of guests/ hosts. This means that the platform does not interfere, judge cases of disputes, or take actions against profiles (unless serious safety issues are detected and confirmed) (Couchsurfing, 2018).

immediately ready- to-drive by the next user. Such customer engagement can promote a collective sense of responsibility within the community, which makes the cost externalization and thus lower prices possible for the business.

In both cases, there exists some sense of communality (Belk, 2014a; John, 2017; Fedosov, 2020) that makes services at lower cost possible. In the C2C case, the fact that the participants take some risks they would not accept on a formal and merciless market (e.g., the risk that an accommodation has some flaws) make the lower cost possible. In the B2C case, it is the willingness to do voluntary work in the interest of the community that keeps the cost low – bearing in mind that this voluntary work is essential to keep the sharing system functioning (otherwise, imagine that users of Zipcar leave cars in a condition which is not suitable for immediate use).

This explains why prices for the services offered in the DSE remain lower than the prices for their equivalent in the formal market. This works because sharing systems define themselves in opposition to the formal and fully regulated market and maintain some sense of communality among their participants – even if the community is large and fluctuating and direct social contacts are volatile. Losing this advantage would mean crossing the line to formal and fully regulated business. Sharing platforms constitute themselves in demarcation to their formal market counterparts; it is their *raison d'ètre* to stay below their level of formality. As a class of resource allocation systems, the DSE is a type of economic behavior with a more or less "heavily weighted social dimension" (Price, 1975, p. 4), which is always strong enough to remain effective.

6. Conclusion

In this article, we presented a novel perspective for describing the phenomenon known as 'the sharing economy'. We conceptualize the phenomenon as a by-product of the digital transition of society and therefore call it 'the digital sharing economy' (DSE). The core idea of our conceptual analysis is to distinguish three fundamental aspects of the DSE: (1) the technical aspect of sharing that refers to the characteristic of a resource of being *sharable*; (2) the social aspect of sharing that addresses the patterns and rules of social interactions, including economic transactions, that guide and legitimate the act of sharing; (3) the coordination aspect, which refers to the enabling role of digital online platforms that provide the coordination mechanisms for operationalizing sharing, the core of which is matching supply and demand at close-to-zero transaction cost.

The enabling power of digital technologies has transformed sharing both in theory and practice. In particular, digitalization has been the enabler and catalyst for dealing with a growing variety of sharable resources (transition of the technical aspect of sharing), to realize sharing beyond the limits of small groups and personal relationships (transition of the social aspect of sharing). This two-fold transition has been driven by ICT- enabled platforms that have offered unprecedented efficiency in implementing the coordination aspect of sharing. As a consequence, the DSE has created new patterns and practices of sharing which are located in the space between traditional sharing and the formal market economy. This space is now populated by sharing systems which show a wide variety both regarding the types of shared resources and the levels of formality embodied in sharing practices.

Digital platforms implementing the coordination aspect of the DSE support the execution of all aspects of sharing, including search and match-making, allocation, transaction handling, and post-sharing activities such as providing reviews and feedback. From a social perspective, sharing platforms enhance local interaction and also enable the formation of social connections among spatially distributed communities. Free services (i.e., services without enforced reciprocity or compensation), reciprocal sharing practices, compensation-based sharing practices, and for-fee services represent the spectrum covered by the DSE on the dimension of social practices. This spectrum fills the space between the pre-existing extremes of traditional sharing and the formal market economy.

With respect to for-profit schemes – which we included by definition in the DSE – and pricing in digital sharing systems, we explained why such schemes can be expected to maintain lower prices compared to equivalent services provided by their counterparts in the formal market.

Our main conclusion is that it is of crucial importance to analyse the DSE as a phenomenon that has transformed both the technical and the social aspects of sharing. By proposing an inclusive definition and the foundations of a theoretical framework for the DSE, we hope to contribute to reducing the ambiguity in the discourse on this evolving phenomenon.

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Declaration of Competing Interest

The authors report no declarations of interest.

Appendix A

See Fig. A1 and Table A1.

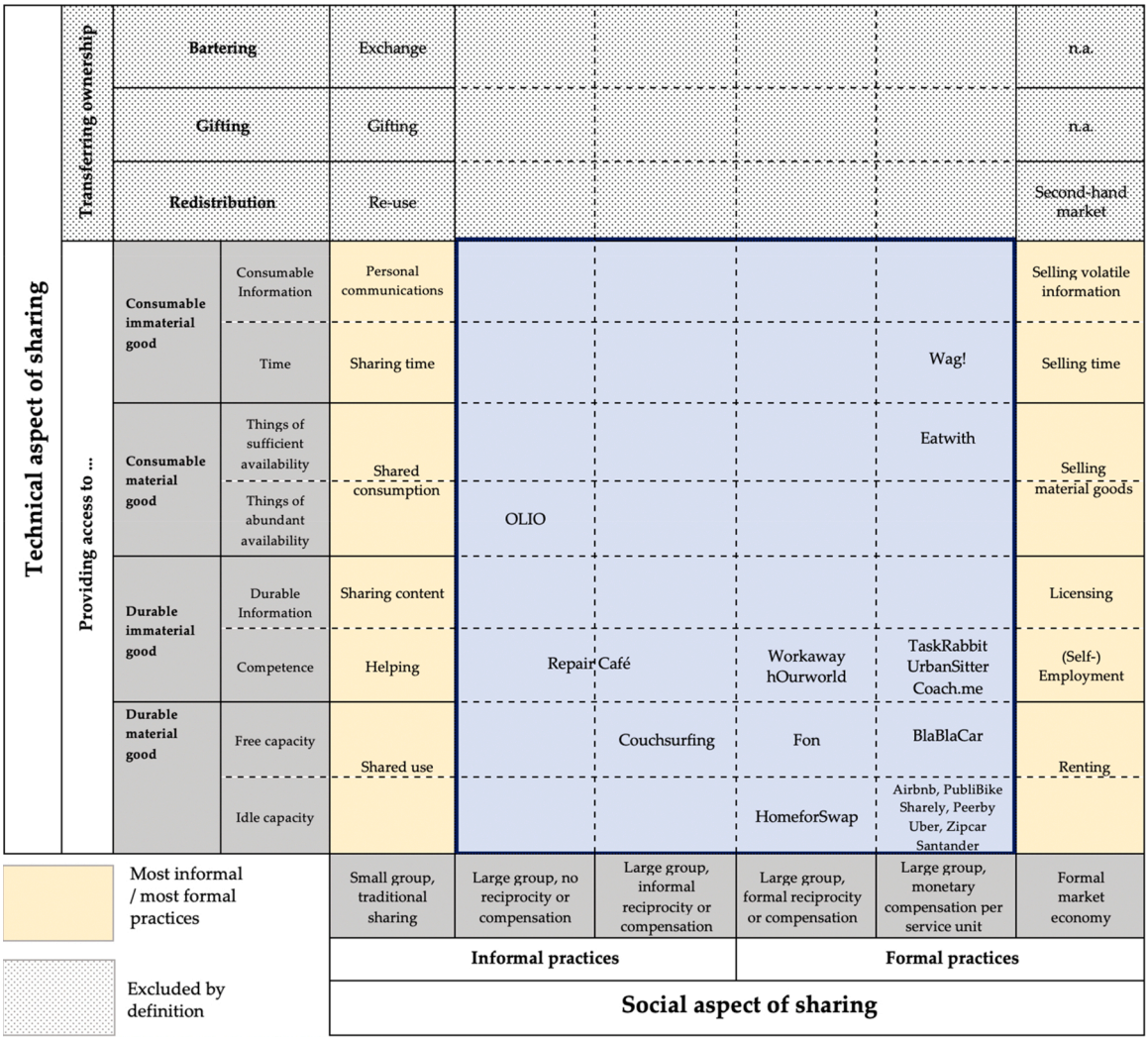

Fig. A1. Examples of sharing systems mapped to the matrix.

Table A1
Examples of sharing systems.

Platform	Area of service	URL
Airbnb	Lodging, hospitality	https://www.airbnb.com
BlaBlaCar	Carpooling	https://www.blablacar.com
CouchSurfing	Lodging, homestay	https://www.couchsurfing.com
Fon	Wi-Fi network	https://fon.com
OLIO	Free food sharing	https://olioex.com
Peerby	Everyday object lending	https://www.peerby.com
PubliBike	Mobility	https://www.publibike.ch
TaskRabbit	Personal service	https://www.taskrabbit.com
hOurworld	Time bank	https://hourworld.org
Uber	Mobility, ride services	https://www.uber.com
Zipcar	Mobility, car sharing	https://www.zipcar.com
HomeforSwap	Lodging, homestay	https://www.homeforswap.com
UrbanSitter	Babysitting	https://www.urbansitter.com
Workaway	Accommodation	https://www.workaway.info
Eatwith	Culinary experience	https://www.eatwith.com
Coach.me	Coaching, personal development	https://www.coach.me
Wag!	Pet sitting, dog walking	https://wagwalking.com
Santander	Bike sharing	https://www.santandercycles.co.uk
Sharely	Everyday object lending	https://www.sharely.ch
Repair Café	Free repairing	https://www.repaircafe.org

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